



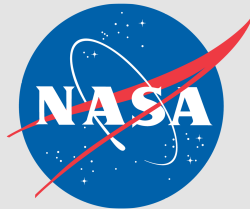
NOAA/NASA

Annual Global Analysis for 2020

It was a Dead Heat

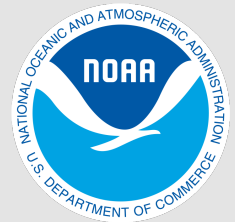
Gavin A. Schmidt

*Director, NASA's Goddard Institute
for Space Studies*



Russell S. Vose

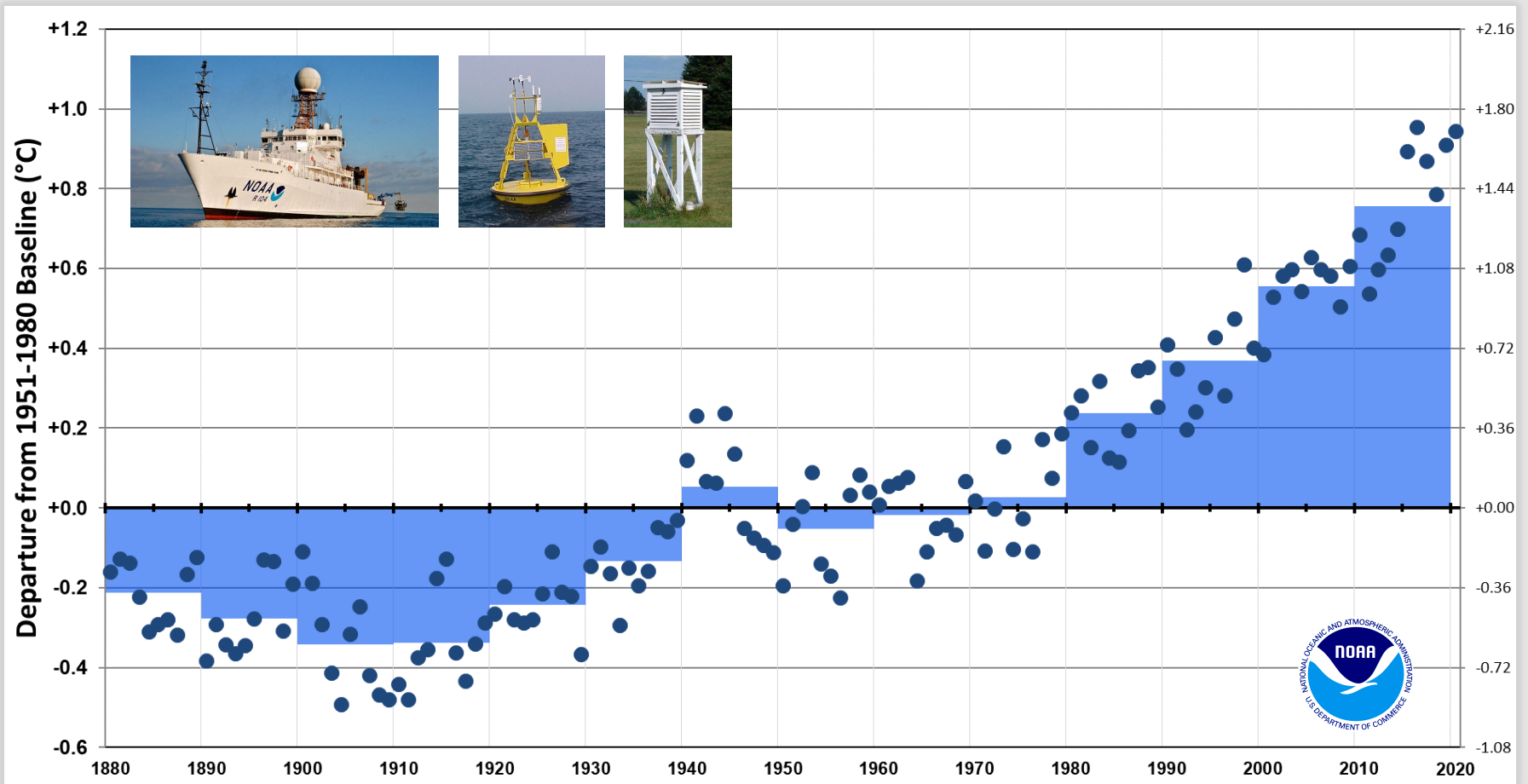
*Chief, Analysis and Synthesis Branch, NOAA's
National Centers for Environmental Information*



January 2021

NOAA: 2020 Almost Made History

0.98°C (1.76°F) above 1901-2000 baseline*, slightly cooler than 2016

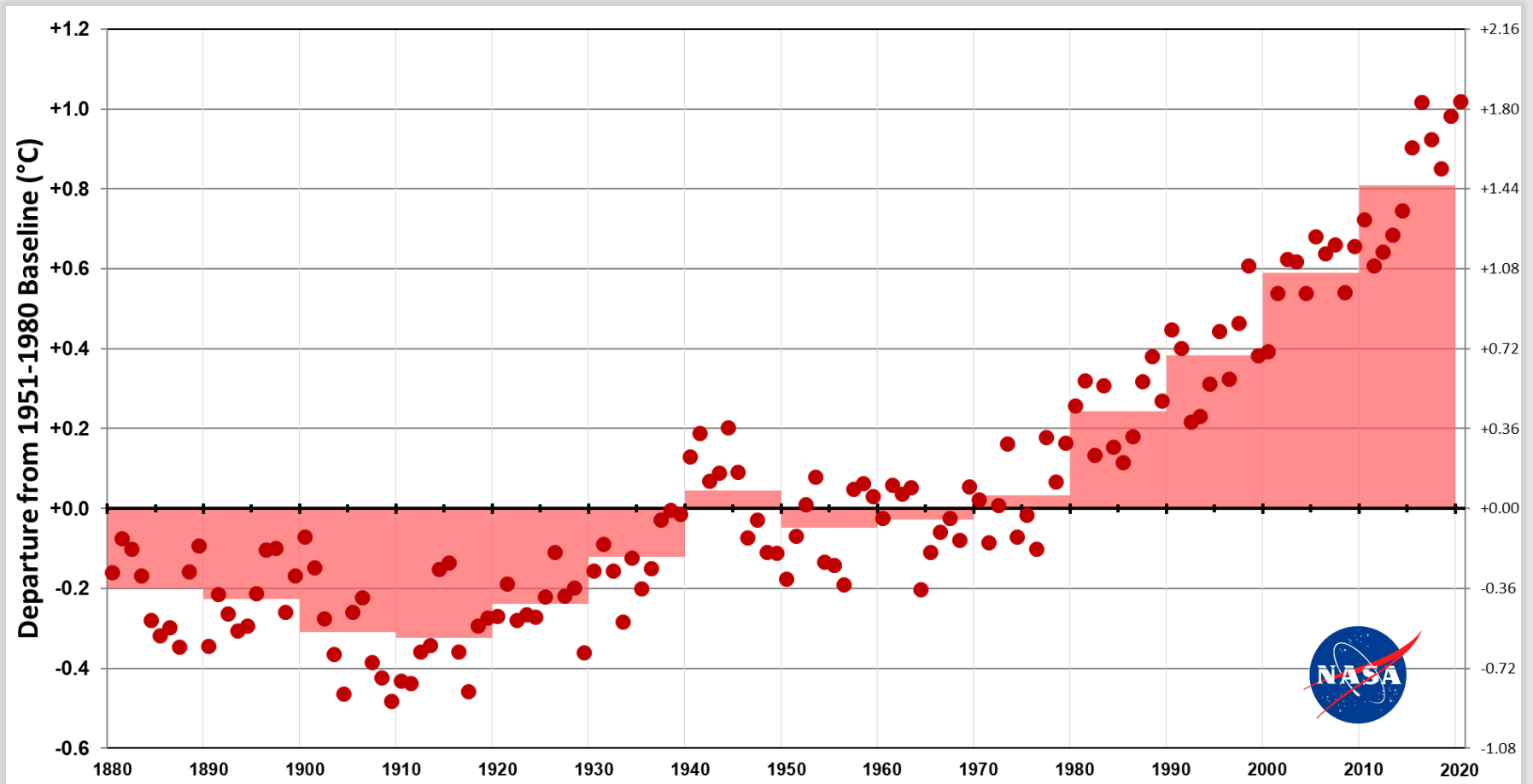


*NOAA uses 1901-2000 as the baseline in its monthly reports.

For reference purposes, 2020 was 0.94°C (1.70°F) above the 1951-1980 baseline.

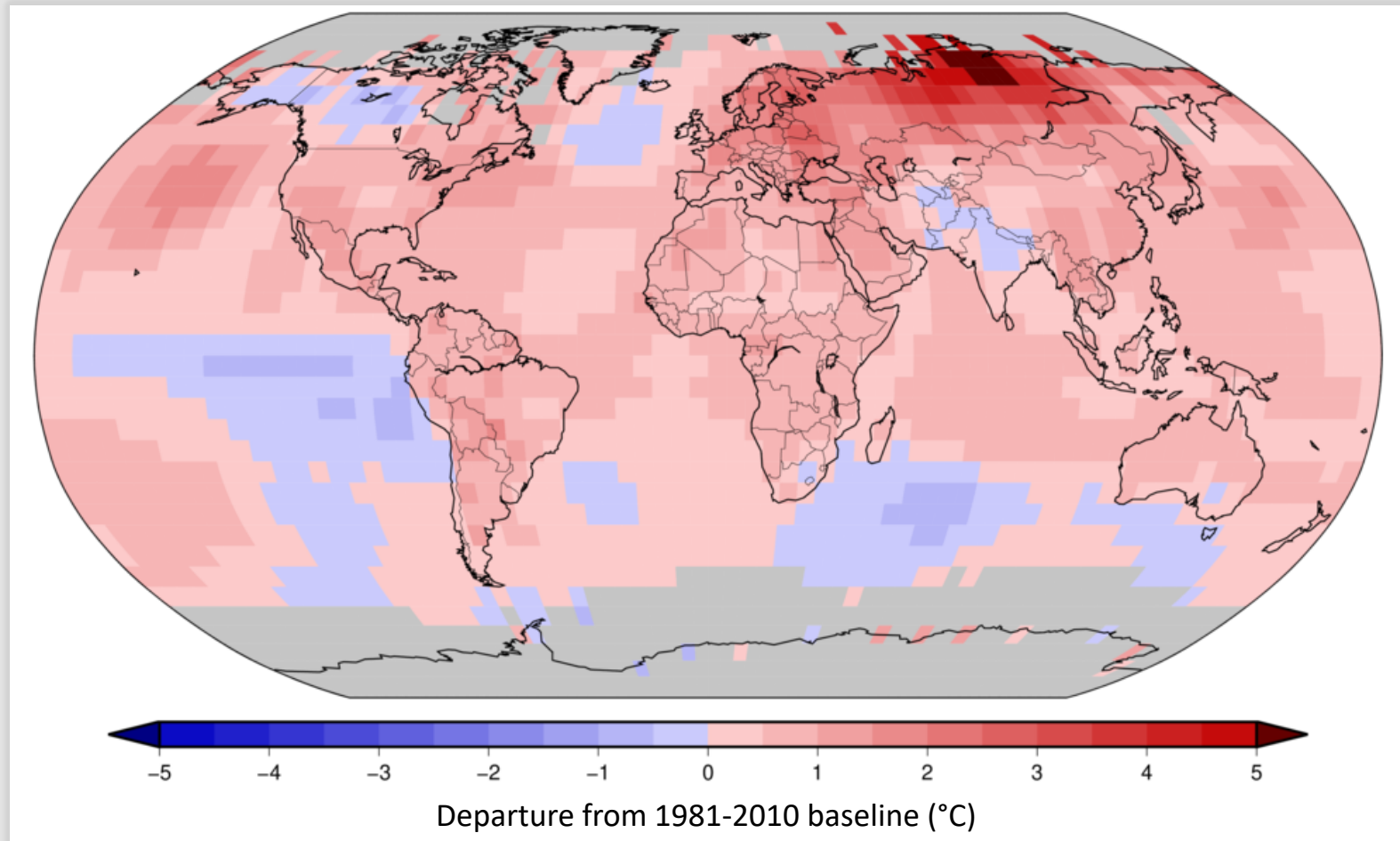
NASA: 2020 Tied for Warmest Year

1.02°C (1.84°F) above 1951-1980 baseline, matching 2016



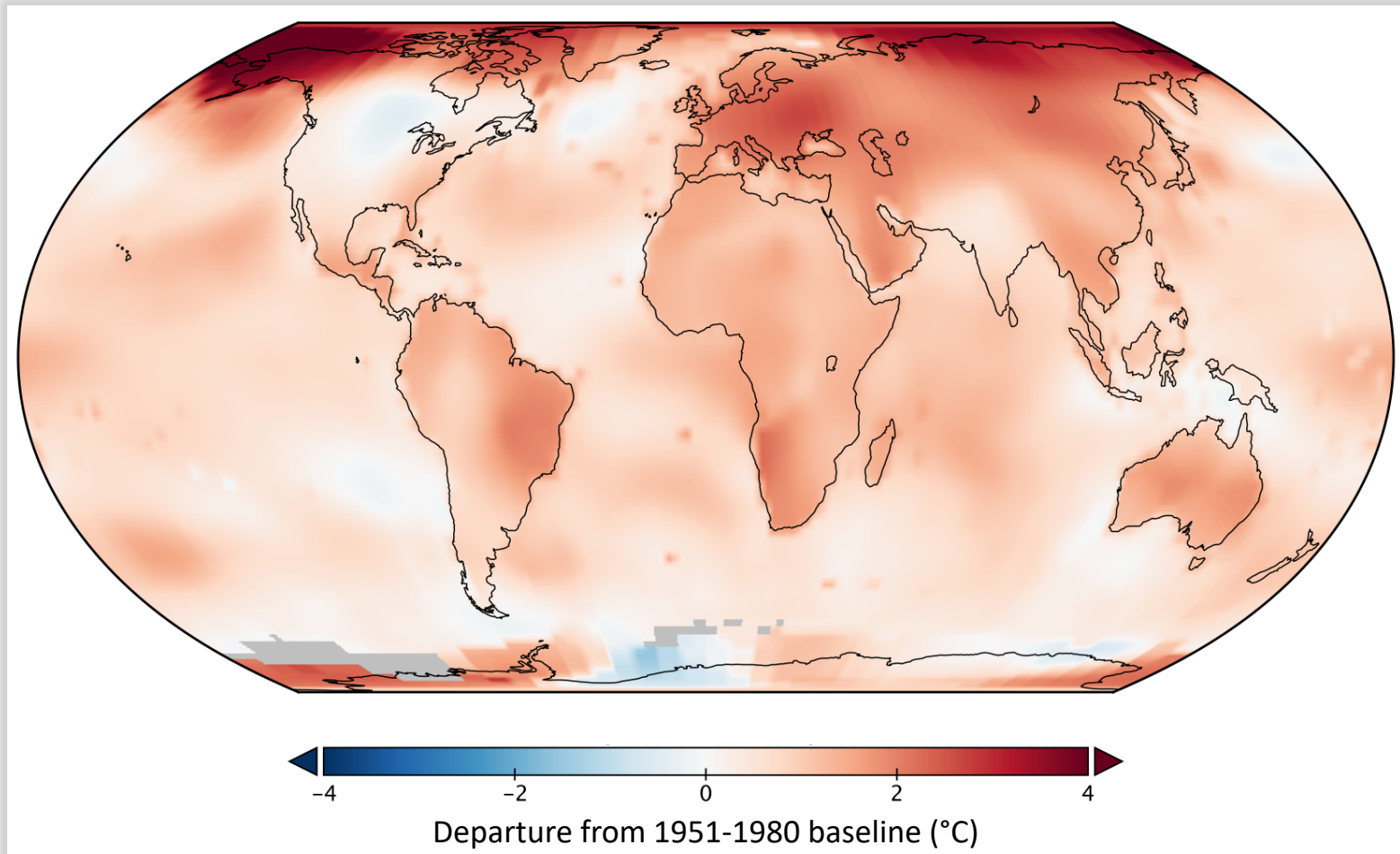
NOAA: Record Warmth over Land

Persistent heat in northern Siberia; emergent La Niña in the eastern Pacific



NASA: Above the Baseline in Most Regions

Notable warmth in the Arctic and parts of the Antarctic



NOAA: Significant Events of 2020

Europe and Asia were warmest on record

GLOBAL AVERAGE TEMPERATURE

The January–December 2020 average global land and ocean surface temperature was the second highest since global records began in 1880.

ALASKA

Alaska's 2020 statewide temperature departure of 1.5°F above average was the smallest since 2012.

NORTH AMERICA

North America had its 10th-warmest year on record.

ARCTIC SEA ICE EXTENT

During its growth season, the Arctic had its 11th-smallest annual maximum extent on record. During its melt season, the Arctic had its second-smallest minimum extent on record.

EUROPE

The year 2020 was Europe's warmest year on record. This was the first year where Europe's annual temperature departure was over +2.0°C (+3.6°F). The years 2014–2020 all rank among Europe's seven warmest years on record.

ASIA

Asia's 2020 temperature was also the highest in the 111-year record. The year 2020 also marked the first time Asia had an annual temperature departure greater than 2.0°C (3.6°F). Asia's 10 warmest years have occurred since 2002.

CONTIGUOUS UNITED STATES

The contiguous U.S. had its fifth-warmest year since national records began in 1895. A maximum temperature of 130°F was observed in Death Valley, California on August 16, 2020. If verified, this would be the warmest August temperature on record and the third-warmest temperature for any month across the U.S.

ATLANTIC HURRICANE SEASON

Above-average activity:
30 storms, 13 hurricanes
The year 2020 had the highest number of tropical cyclones in a single year, surpassing the previous record of 28 set in 2005. Official records date back to 1851.

CYCLONE AMPHAN

(May 16–21, 2020)
Maximum winds — 270 km/hr
Amphan brought strong winds and dangerous storm surge to coastal areas of West Bengal in India and Bangladesh.

WESTERN NORTH PACIFIC OCEAN TYPHOON SEASON

Below-average activity:
23 storms, 12 typhoons

EASTERN NORTH PACIFIC HURRICANE SEASON

Below-average activity:
16 storms, 4 hurricanes

AFRICA

Africa had its fourth-warmest year on record.

HURRICANE ETA & IOTA

(November 1–18, 2020)
Maximum winds — 260 km/hr
Both storms made landfall as category 4 hurricanes within 25 km of each other in Nicaragua less than two weeks apart. Both storms brought heavy rain and flooding to isolated regions in Central America.

CYCLONE GATI

(November 21–24, 2020)
Maximum winds — 185 km/hr
Gati was the strongest cyclone to make landfall in Somalia.

NORTH INDIAN OCEAN CYCLONE SEASON

Above-average activity:
5 storms, 4 cyclones

TYPHOON GONI

(October 26–November 6, 2020)
Maximum winds — 315 km/hr
Goni was one of the most powerful landfalling typhoons on record.

SOUTH AMERICA

South America's 2020 temperature departure from average ranked as the second-highest in the 111-year record. Only the year of 2015 was warmer.

GLOBAL TROPICAL CYCLONE

103 storms, 45 hurricanes
The total number of named storms in 2020 tied the record set in 2018.

SOUTH INDIAN OCEAN CYCLONE SEASON

Near-average activity:
17 storms, 9 cyclones

SOUTHWEST PACIFIC OCEAN CYCLONE SEASON

Above-average activity:
10 storms, 5 cyclones

AUSTRALIA

Australia had its fourth-warmest year since national records began in 1910.

ARGENTINA

Argentina had the second-warmest year on record. Argentina's five warmest years have all occurred since 2012.

ANTARCTIC SEA ICE EXTENT

During its growth season, the Antarctic had its 11th-highest annual maximum extent. During its melt season, the Antarctic had a near-average annual minimum extent.

NASA: ENSO Impacts Global Temperature

Contribution much smaller in 2020 than in 2016

ENSO impact in specific years:

2016: 0.11°C

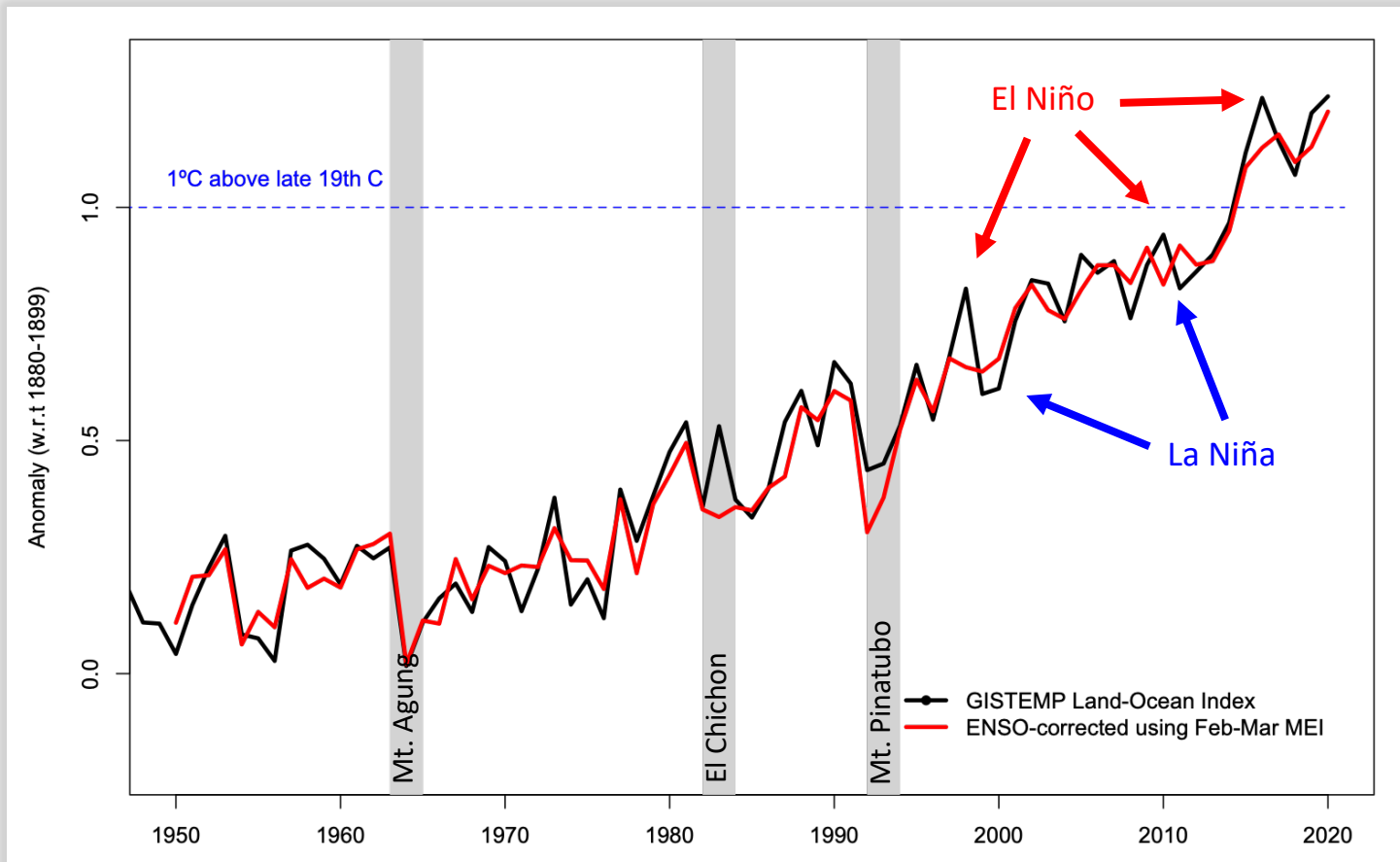
2017: -0.01°C

2018: -0.03°C

2019: 0.07°C

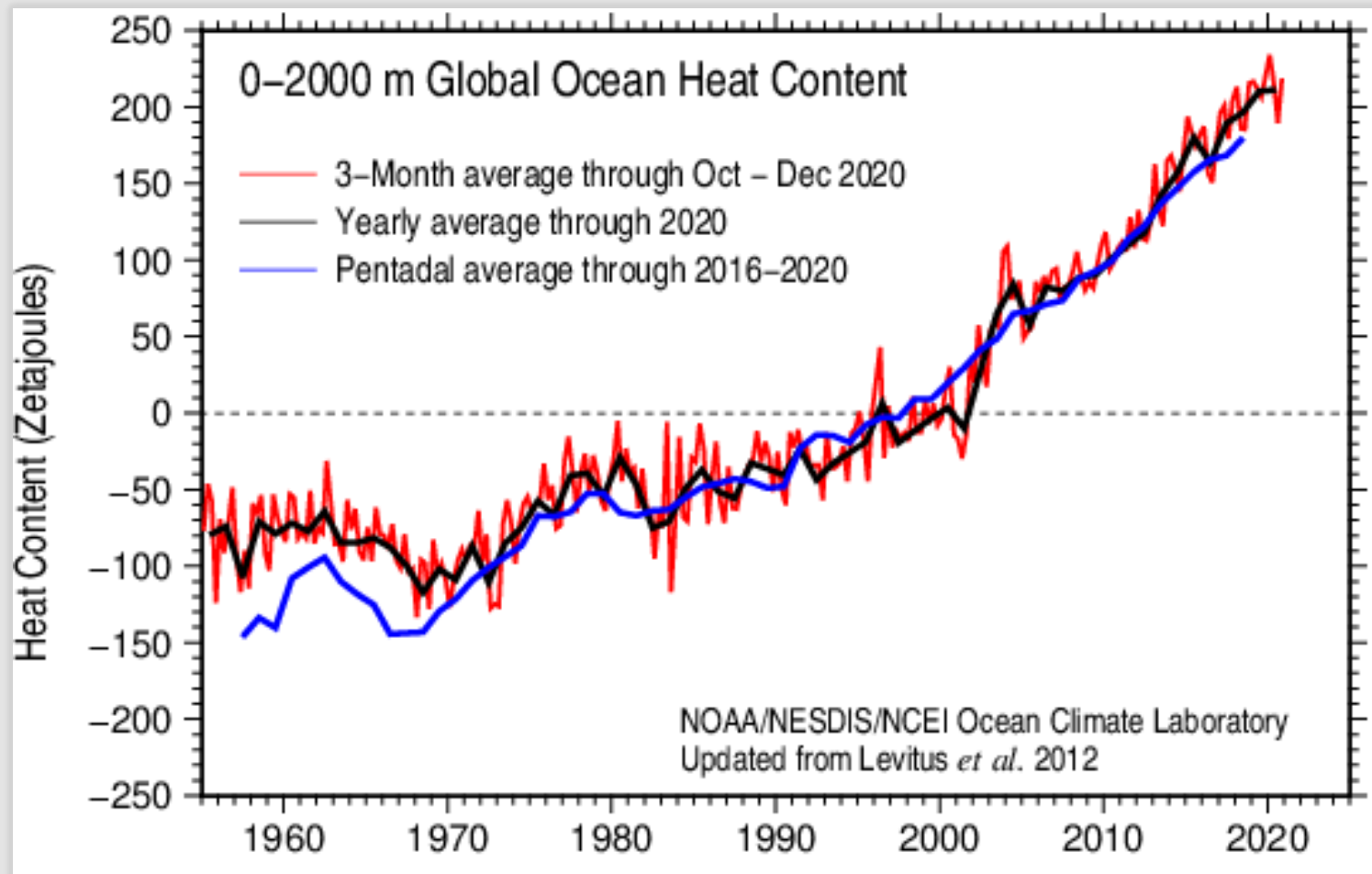
2020: 0.03°C

(Max. correlation with annual global mean is Feb-Mar ENSO index)



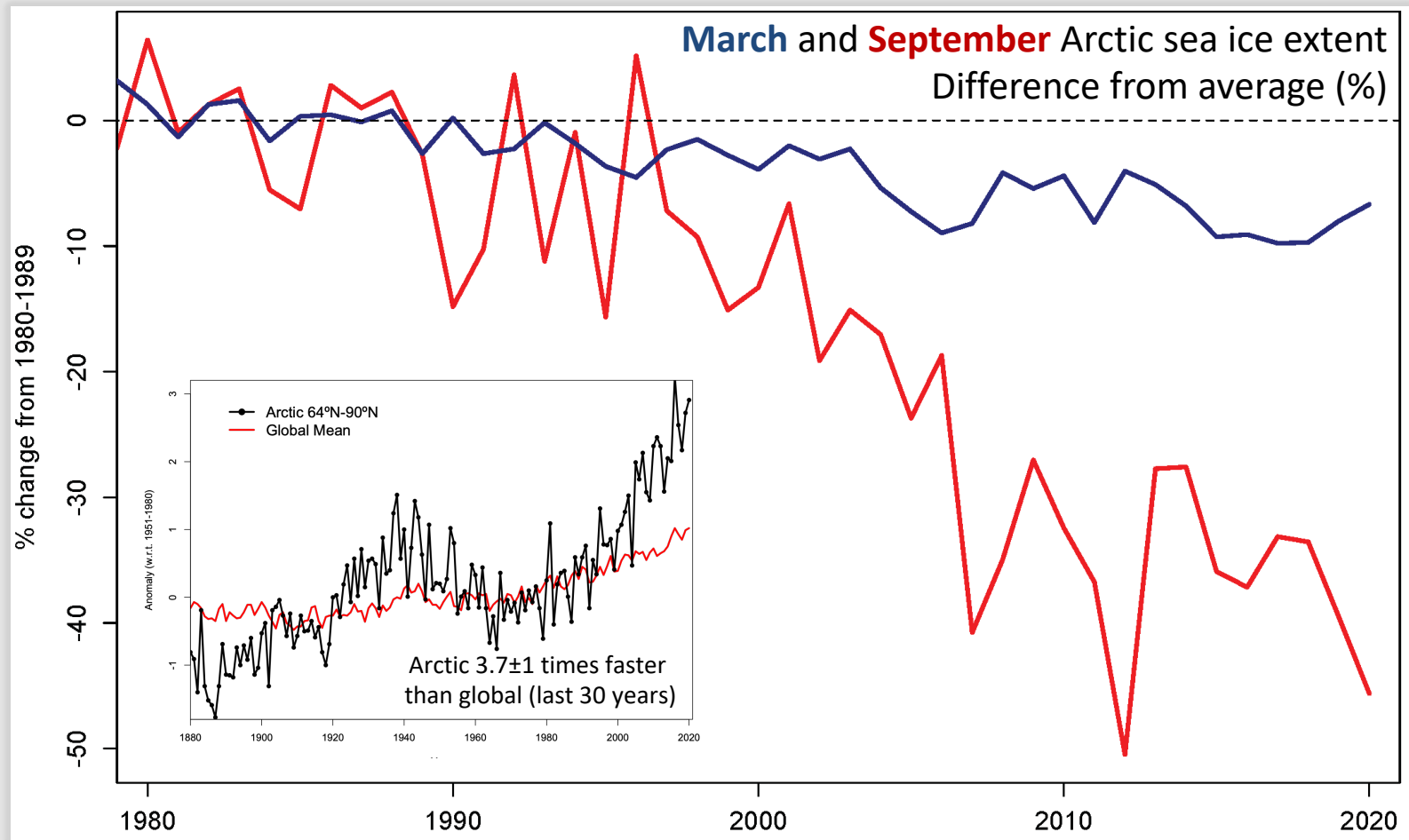
NOAA: Rising Ocean Heat Content

Oceans absorb more than 90% of the excess heat



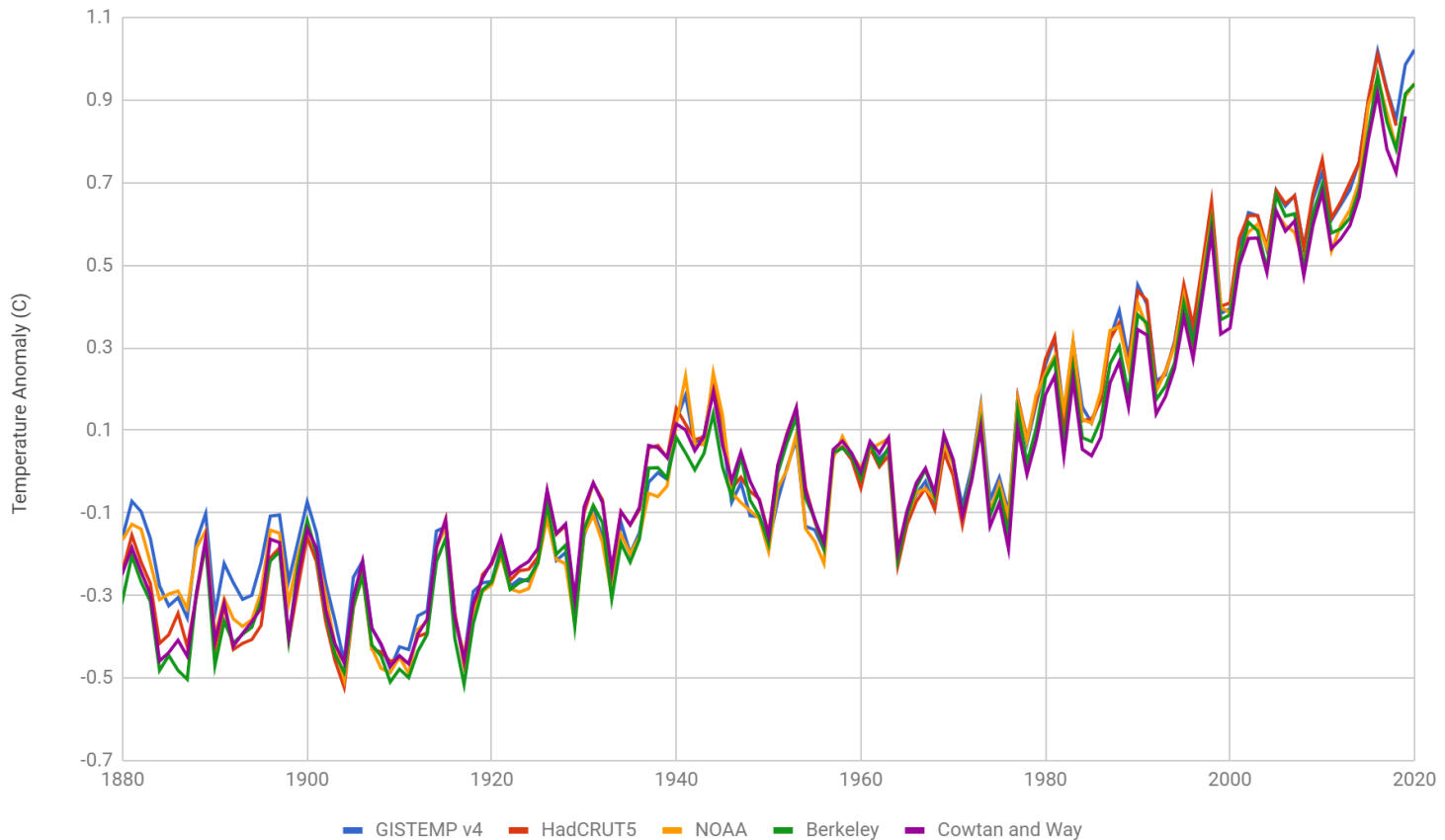
NASA: Declining Arctic Sea Ice Extent

2020 tied with 2016 for smallest average annual extent



The Analyses Track One Another over Time

Despite Differences in Methodology and Coverage



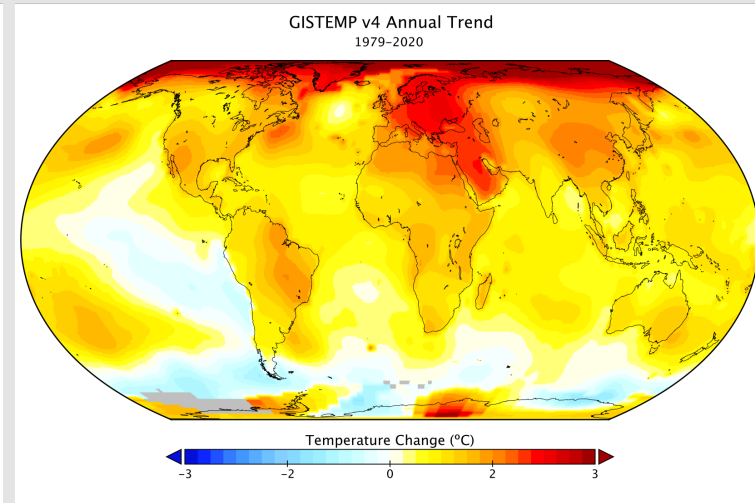
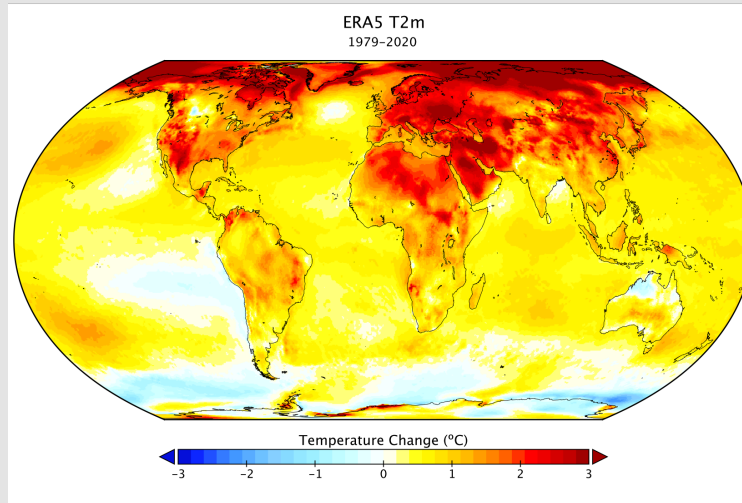
Evaluation Against Reanalysis and Remote Sensing

Independent data sets validate NASA analysis

**ERA5 is the latest
ECMWF reanalysis.**

Trends 1979-2020:

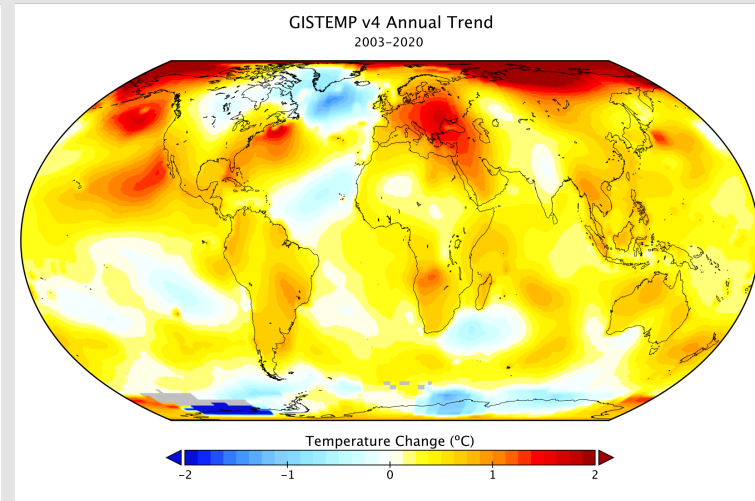
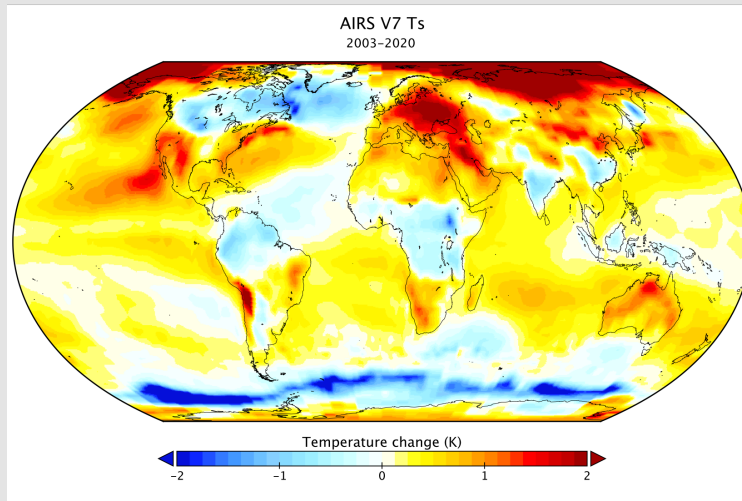
**ERA5: 0.81°C
GISTEMP: 0.81°C
NOAA: 0.74°C**



**AIRS is an instrument
on Eos Aqua.**

Trends 2003-2020:

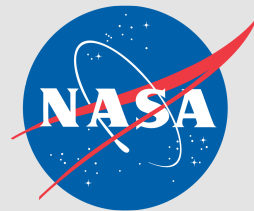
**AIRSV6: $0.46 \pm 0.15^{\circ}\text{C}$
AIRSV7: $0.31 \pm 0.18^{\circ}\text{C}$
GISS: $0.46 \pm 0.15^{\circ}\text{C}$
NOAA: $0.42 \pm 0.15^{\circ}\text{C}$**



Questions?

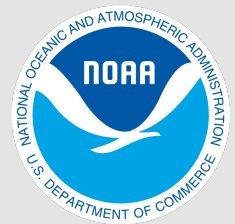
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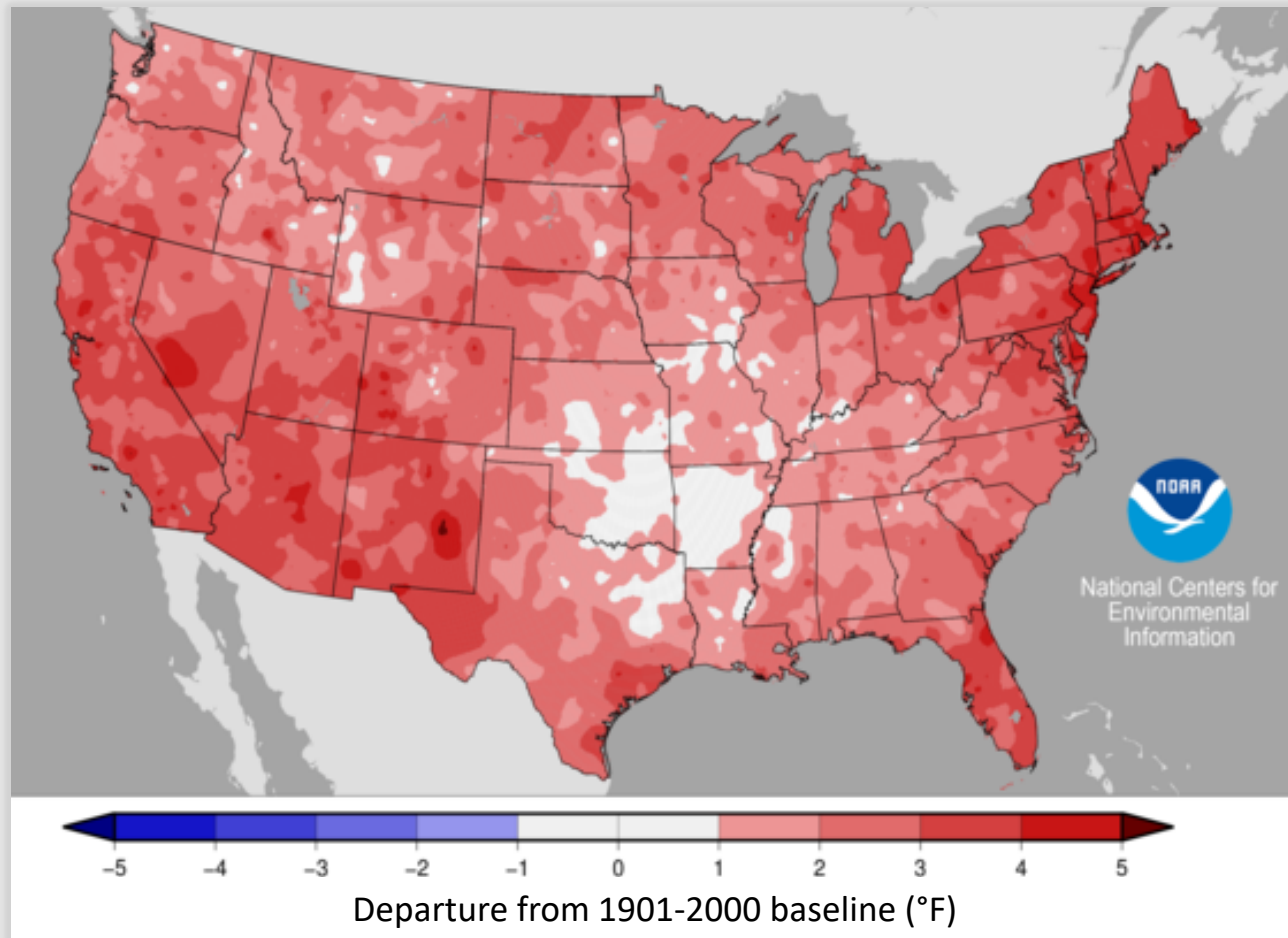
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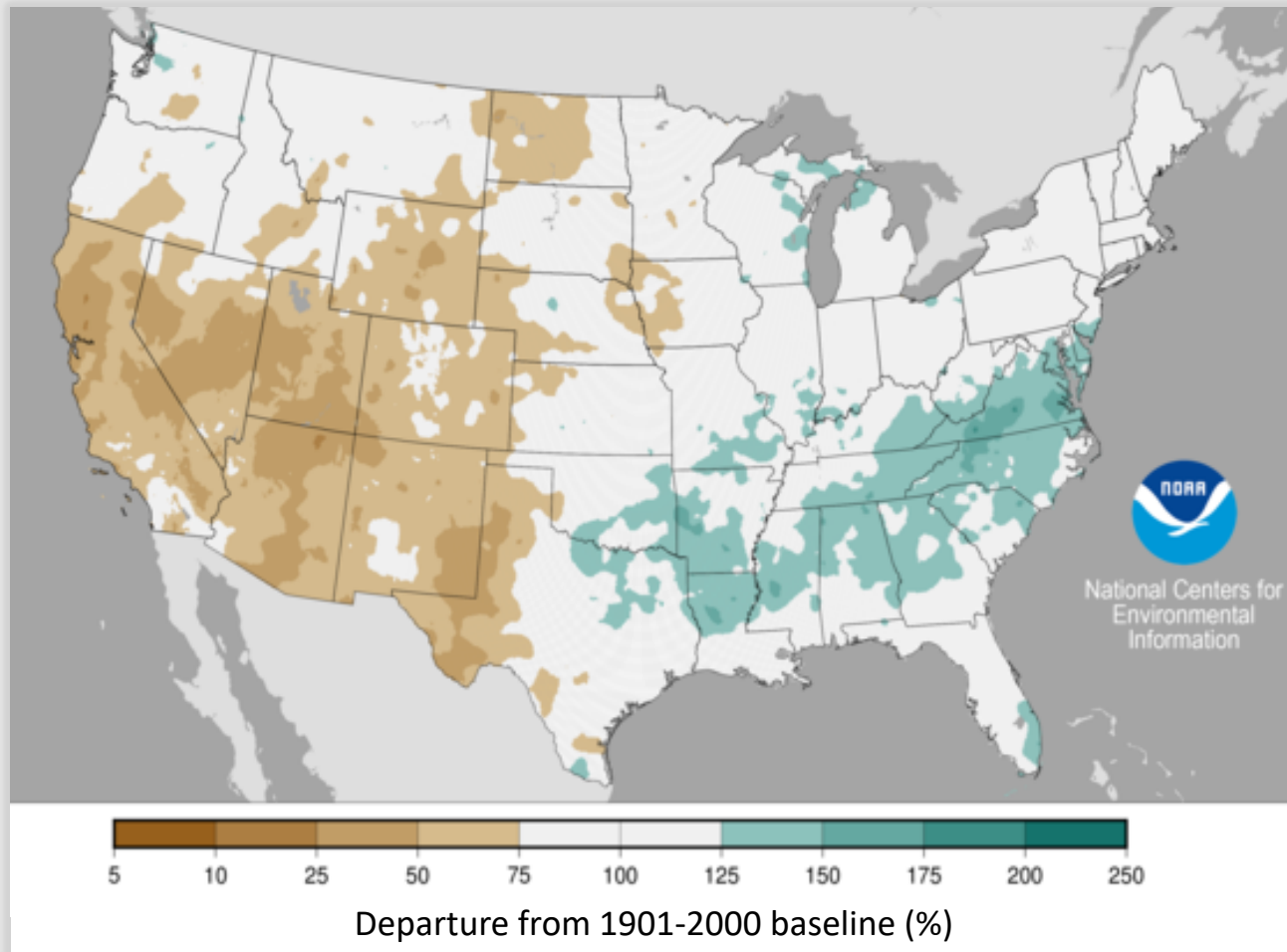
5th Warmest Year since 1895

National average: 52.4°F (2.4°F above baseline)



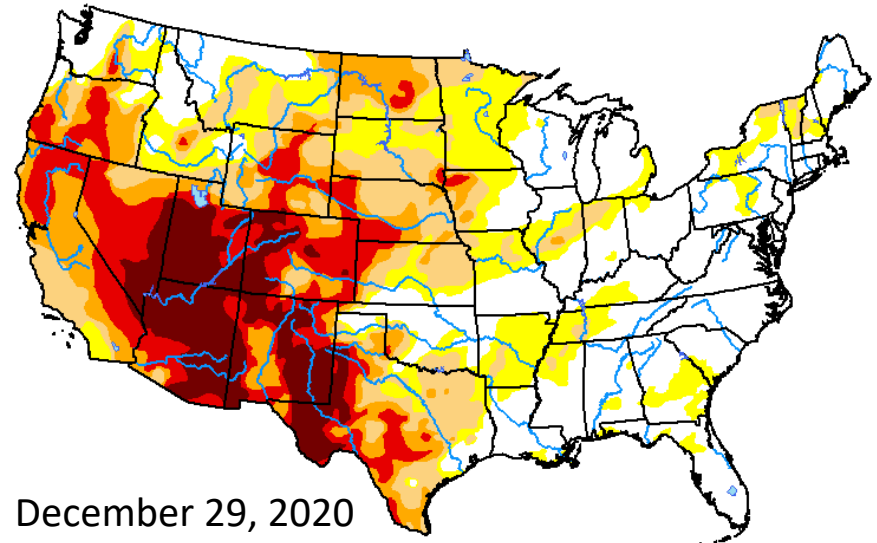
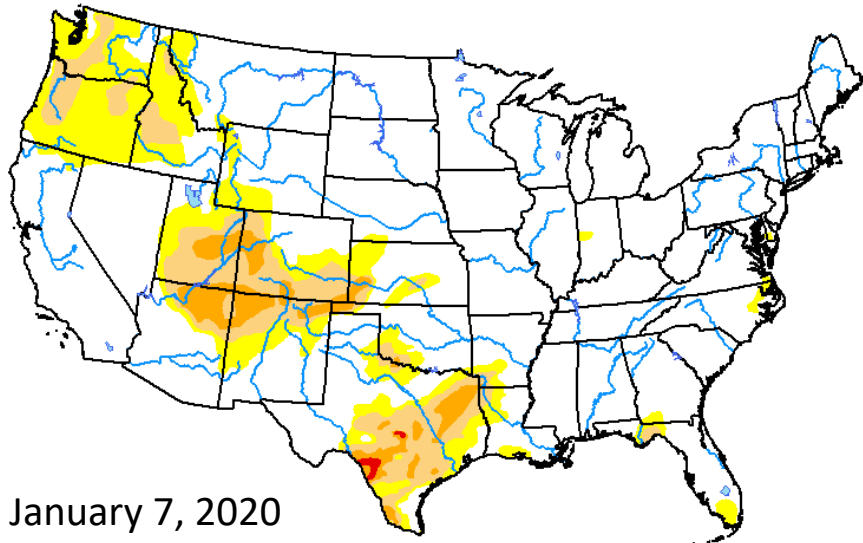
Dry in the West, Wet in the Southeast

National average: 30.28 in (barely above average)



Expanding Drought Extent and Severity

50% of U.S. in drought or abnormally dry at end of 2020



NATIONAL
INTEGRATED
DROUGHT
INFORMATION
SYSTEM

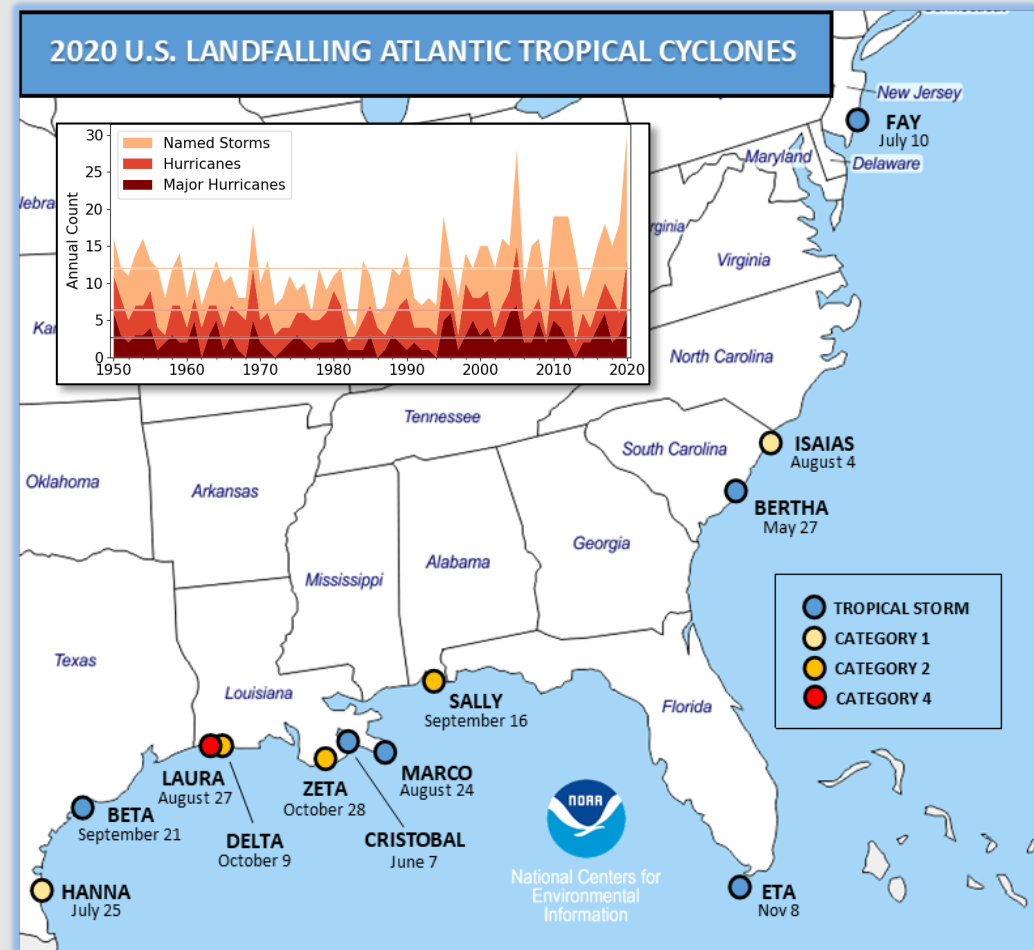


Drought.gov
U.S. Drought Portal

Record-Setting Atlantic Hurricane Season

Broke out the Greek alphabet in mid-September

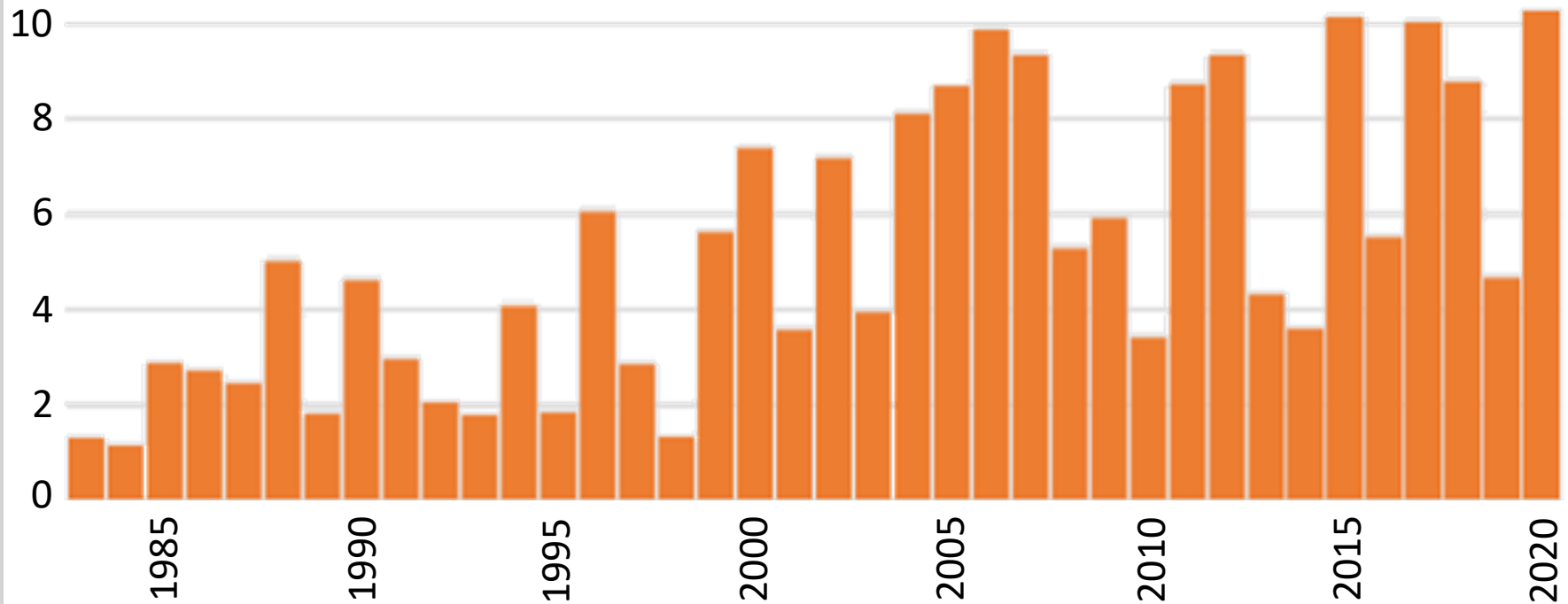
- 30 named storms (highest)
- 13 hurricanes and 6 major hurricanes (2nd highest)
- 12 tropical cyclones made landfall in U.S. (highest)



Record-Setting Wildfire Season

Over 10 million acres burned, California and Colorado were scorched

U.S. Wildfire Acres Consumed (Millions)



Record Year for Billion-Dollar Disasters

22 events in 2020 (highest), \$95 billion in losses (4th highest)

